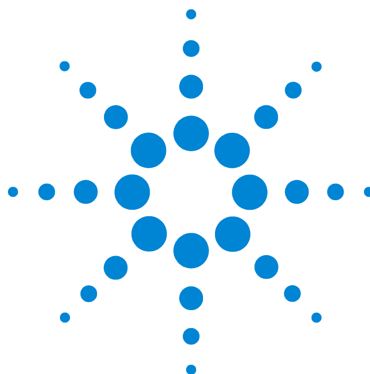
沪制02220128号



Agilent 3200D Dissolved Oxygen Meter
溶解氧测定仪

Operating Guide
用户手册



Agilent Technologies

Notices

Manual Part Number

5973-1779

Edition

First edition, March 2012

Printed in China

Agilent Technologies, Inc.
412 Ying Lun Road
Waigaoqiao Free Trade Zone
Shanghai 200131 P.R.China

Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Safety Notices

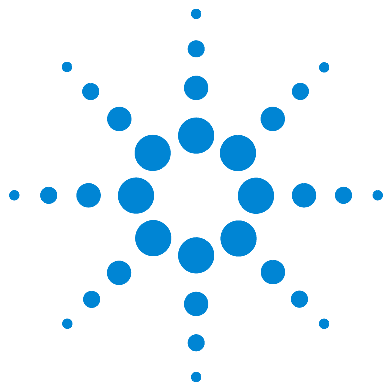
CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents



1
Installation

The tools and accessories necessary for installation are shipped with the 3200D Dissolved Oxygen Meter.



Tools and Components for Installation

Agilent provides the tools needed for installation. The following accessories are included in the shipping case.

- Multifunction electrode holder (G4389A)
- D6111 DO Probe (5190-3997)
- Power adaptor (5185-8389)

Installing the 3200D Dissolved Oxygen Meter

Open the 3200D Dissolved Oxygen Meter shipping case. Remove the meter, electrode holder, and other accessories.

Installing the electrode holder

1 Place the electrode holder near the meter and move the arm into position. Use the thumbscrews shown in Figure 1 to secure the arm in place.

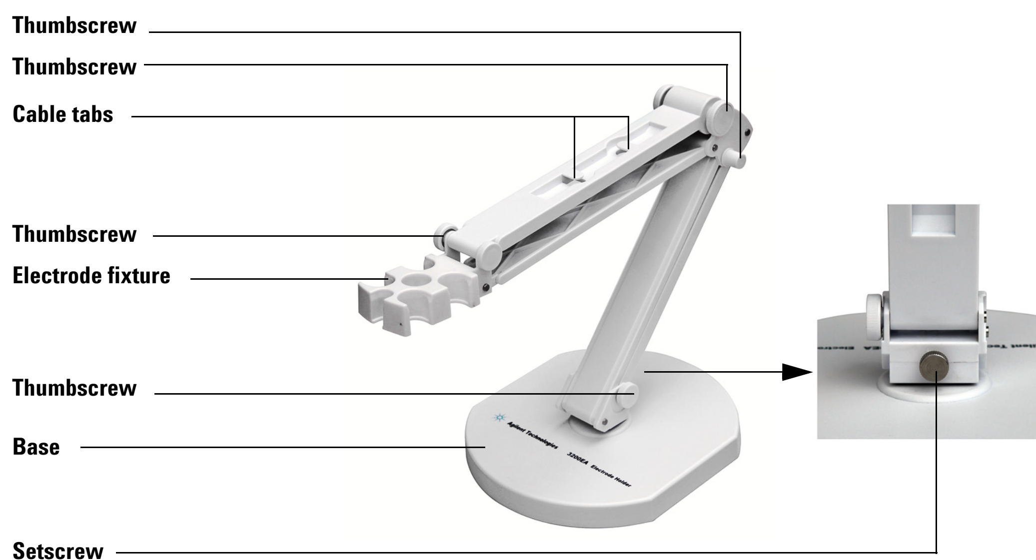


Figure 1 The electrode holder

2 Clip the DO (dissolved oxygen) probe into the electrode fixture shown in Figure 1.

NOTE The DO probe includes an ATC probe.

3 Route the probe cable as shown Figure 2.

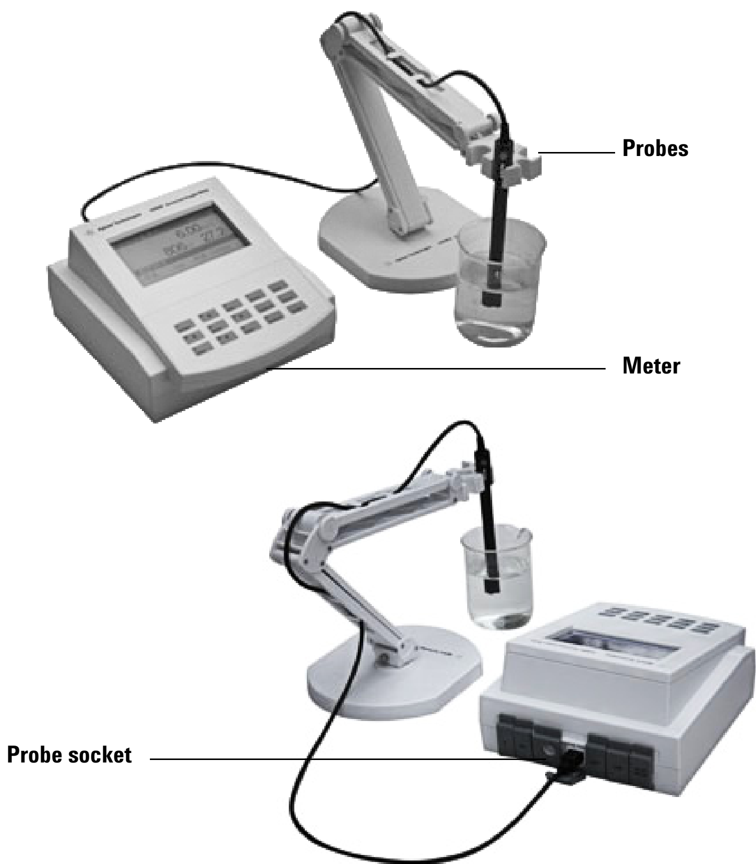


Figure 2 Installed meter and probes

4 Locate the **DO/Temp** probe socket on the back of the meter. Plug the DO probe connector (5190-3997) into the **DO/Temp** socket on the rear of the meter. See Figure 3.

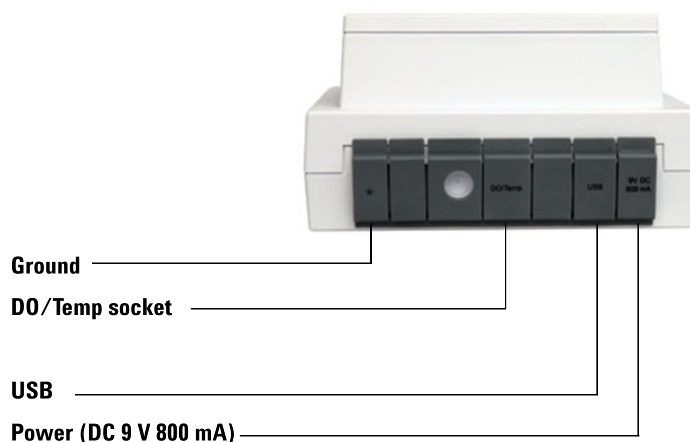


Figure 3 The back view of the 3200D Dissolved Oxygen Meter

Installing the probe

1 Locate the socket for the DO probe on the back panel of the meter. Insert the probe connector into the socket.
2 Feed the probe cable through the hole of the multifunction electrode holder.



Figure 4 Installing the probe

Installing the power adaptor

The universal power adapter included with your benchtop meter is the only power adapter recommended for use with this unit.

The external electrical power adapter is rated at 100 to 240 VAC, 1 A, 50/60Hz.

This power adaptor includes a plug converter that supports several kinds of plugs.

1 Choose the appropriate power plug.
2 Connect the output plug of the power adapter to the power input on the meter. A click will be heard when the plug is properly engaged.



Figure 5 Installing the power adaptor

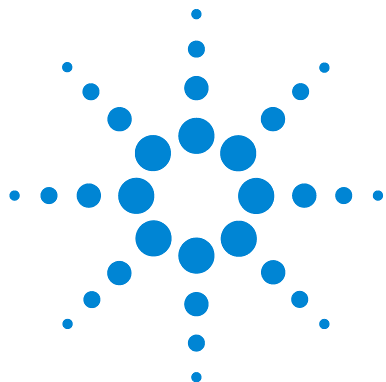
Installing the optional ground line

The meter ships with an optional ground line. During use, if another device (such as a constant temperature bath) causes electrical interference and an unstable reading, install the ground line. Connect one terminal of the ground line to the meter ground socket (⏚) and the other terminal to the interference source.

Installing Optional Software

If purchased, install the optional G4390A Electrochemical Data Collecting Software now. The software provides communications between the meter and a computer. Connect the computer to the meter with a USB cable. See the G4390A software documentation for more information.

If not using the G4390A software, Agilent provides downloadable data printing software on the Agilent Customer Portal (see "Agilent customer portal" on page 16). To use this software, download it from the portal and install it. Then connect the meter to the PC using the USB cable. Refer to the data printing software documentation for more information.



2
Operation

This chapter provides an overview of the individual components that make up the 3200D Dissolved Oxygen Meter.

Introduction

Where to find information

This document describes how to install, operate, maintain, and troubleshoot the 3200D Dissolved Oxygen Meter.

Before operating your meter, be sure to read the meter installation and operation information.

Agilent customer portal

Agilent also provides customized information for the products you own through a customer portal. This web service provides many customizable services as well as information related directly to your Agilent products and orders. Log onto the portal at **http://www.agilent.com/chem**.

Term definitions

Dissolved oxygen concentration	The extent of oxygen molecules dissolved in the water solution under certain conditions in mg/L
Dissolved oxygen saturation	The ratio of actual DO concentration versus saturated DO concentration in percent (%)
Barometric pressure	Barometric pressure in kPa
Salinity	The salinity in water in g/L
Zero point calibration	Probe calibration in an oxygen-free solution (freshly prepared 5% sodium sulfite solution)
Full scale calibration	Probe calibration in air-saturated water

Proper use

The most common safety issues when working on the meter include:

- Ground the meter using the connection on the back.
- The meter can be used continuously for a long time. After each measurement, soak the DO probe in distilled water, which is first boiled and then cooled. Do not soak the DO probe in sodium sulfite solution. If a probe is out of use for more than 6 hours, rinse and store it in a protective container.

CAUTION Do not expose to corrosive gas. Keep the sockets on the back of the meter clean and dry. Do not allow contact with acid, alkaline, or salt solutions.

CAUTION Only use the power adapter included with the meter.

CAUTION The probe must be polarized for at least 60 minutes after installing a new membrane or after replacing the electrolyte.

WARNING **Be sure that the meter has a good ground connection.**

Features

The 3200D Dissolved Oxygen Meter is a state-of-the-art and customer-friendly benchtop analytical instrument for the measurement of DO concentration and saturation in aqueous solutions with high accuracy. It can measure temperature simultaneously.

3200D Dissolved Oxygen Meter features include:

- Measurement of DO concentration, saturation and temperature
- Calibration, both Zero Point and Full Scale
- A clear dot-matrix LCD display
- Supports GLP standards:
  - Requires an operator number
  - Records, views, and prints calibration data
  - Stores 200 sets of measuring data
- Can view, print, and delete stored measuring data
- Three measuring modes to meet the needs of various users:
  - Continuous Mode
  - Timed Reading Mode
  - Auto-Lock Reading Mode
- USB PC connectivity with available communication software
- Power-off protection: When the meter is manually or automatically shut off, the stored measuring data, calibration data, and setting parameters will not be lost.
- A back-lit design that can be used in a dark environment
- A durable key pad

Specifications

Measuring range	
DO concentration	0.00 to 45.00 mg/L
DO saturation	0.0 to 300.0%
Temperature	–5.0 to 110.0 °C
Resolution	
Temperature resolution	0.1 °C
DO concentration	0.01 mg/L
DO saturation	0.1%
Accuracy of electric unit	
DO concentration	±0.10 mg/L
DO saturation	±2.0%
Temperature	±0.1 °C
Normal working conditions	
Environmental temperature	0–40 °C
Relative humidity	<=85%
Power supply	Power adaptor (5185-8389)
Power input	100–240 VAC, 1 A
Power output	9 VDC, 800 mA
Size	(width × depth × height, mm): 190 × 190 × 105
Weight	about 1 kg

CAUTION

Do not use where nearby vibrations will affect the performance. Do not use if corrosive gas is in the air. Do not use near strong electromagnetic fields.

Physical overview

The 3200D is composed of a meter and a probe system. The probe system is held in place by the electrode holder. See Figure 6, Figure 7, and Figure 8.



Figure 6 The meter, electrode holder, and probe

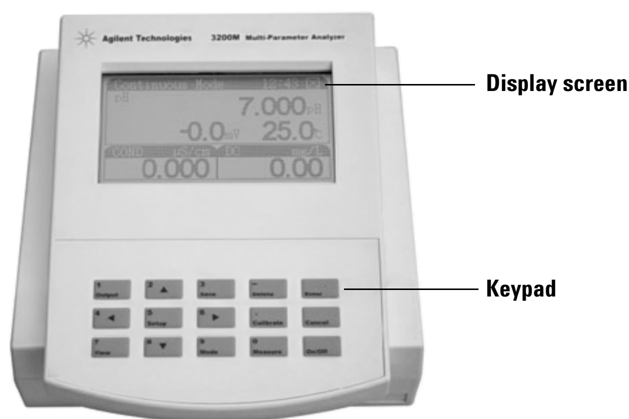


Figure 7 The front view of the 3200D Dissolved Oxygen Meter

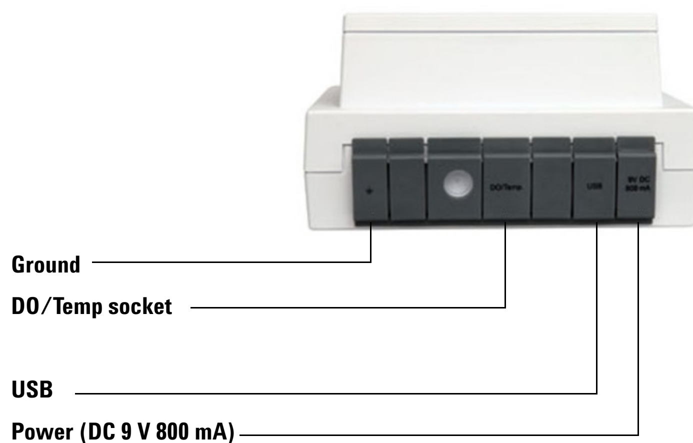


Figure 8 The back view of the Agilent 3200D Dissolved Oxygen Meter

The Display

The display shows the working condition and current setting of the 3200D Dissolved Oxygen Meter.

Mode&Para
09:41
2010/06/20
Continuous Mode
Meas DO
Zero: 0nA
Full:1000nA

Figure 9 The initial state display

The Keypad

The meter has 15 operating keys. The keys are shown in Figure 10 and described in Table 1 on page 23. Most keys have two values, a numeric entry and a function. Which one applies depends on the display; if it is waiting for a number, the numeric entry applies, otherwise, the function applies.



Figure 10 Operating keys

Instrument Control

The 3200D Dissolved Oxygen Meter is usually controlled by the keypad.

Table 1 Keypad functions

Button	Function 1	Function 2
1 Output	Type the number **1**.	Output data when viewing or calibrating stored data.
2 ▲	Type the number **2**.	Move the selection cursor upward when selecting.
3 Save	Type the number **3**.	Store measurement data.
4 ◀	Type the number **4**.	Move the selection cursor left when selecting.
5 Setup	Type the number **5**.	Opens the Setup menu from the initial screen and also is used as a general “select” button.
6 ▶	Type the number **6**.	Move the selection cursor right when selecting.
7 View	Type the number **7**.	View stored or calibrated data.
8 ▼	Type the number **8**.	Move the selection cursor down when selecting.
9 Mode	Type the number **9**.	Switch the display window or parameter when measuring.

Table 1 Keypad functions

Button	Function 1	Function 2
0 Measure	Type the number **0**.	Begin measurement.
. Calibrate	Type a decimal point.	Calibrate the DO probe.
– Delete	Type a negative number.	Delete the data being viewed.
On/Off	Meter power switch	

Turn on the Meter

1 Press [**On/Off**] to turn on the meter. When the meter is powered on, the display shows the Agilent name, the meter model, and other information.

2 After the system self-check, the meter goes to the initial state shown in Figure 11. The left of the screen shows the current system time and the right of the screen shows the current measuring mode, parameter and last calibrated result.

	Mode&Para
09:41 2010/06/20	Continuous Mode Meas DO Zero: 0nA Full:1000nA

Figure 11 The initial state

Setup

Measuring Mode	Sets up current measuring mode (Continuous Mode, Timed Reading Mode, Auto-Lock Reading Mode) and measuring parameter.
Set Condition	Use this mode to set condition for Auto-Lock reading mode.
System Setup	Use this mode to set system time and GLP Standard.
Language Select	The meter supports both Chinese and English languages.
Air Pressure	Set the barometric pressure value.
Set SALI Value	Set the salinity value.

Measuring Mode

This meter supports three measuring modes including Continuous Mode, Timed Reading Mode, and Auto-Lock Reading Mode.

To set the measuring mode:

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12.

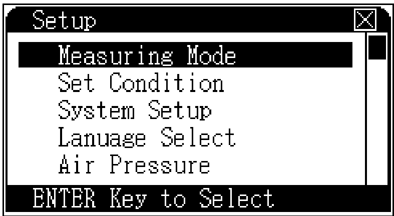


Figure 12 The setup menu

2 Use the directional arrow keys to navigate to **Measuring Mode**.

3 Press **[Enter]** to select **Measuring Mode**. If you need to go back after selecting a menu item, press **[Cancel]** to exit.

4 The **Measuring Mode** screen displays **Parameters** on the left and **Modes** on the right. See Figure 13. Check marks indicate the current selections in use.

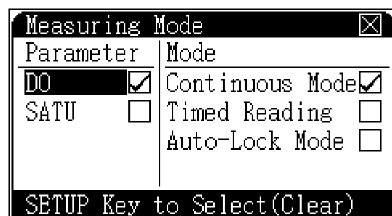


Figure 13 Measuring modes

5 Choose a parameter to display on the initial screen during measurement. Use the arrow keys to highlight the desired parameter and press **[Setup]** to select it. A check appears next to the selected parameter. During measurement, you can still view, save and print the other parameter. See “To view other parameters while measuring” on page 42. The parameter choices are dissolved oxygen and saturation.

6 Use the arrow keys to highlight the desired mode and press **[Setup]** to select it. See “Descriptions of the modes” on page 28 for more information. A check appears next to the selected mode.

7 Press **[Enter]** to save the new setup, exit Setup, and return to the initial state. Press **[Cancel]** to exit Setup without saving changes and return to the initial state.

The new parameters and measuring mode are displayed as shown in Figure 14.

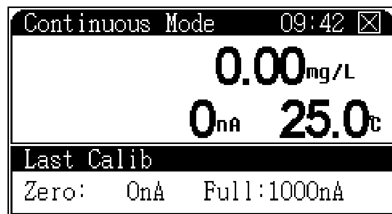


Figure 14 The Continuous Mode display

Descriptions of the modes

Continuous Mode The meter will simply continue measuring, calculating, and displaying the data. It is up to the user to manually save data or end the measurement.

This is the most frequently used measuring mode. When measurement begins, the meter continuously measures, calculates, and displays the results. You can view the calibrated parameter, calibrate the probe, save, or print results at any time during measurement. To end a measurement run, press **[Cancel]** followed by **[Enter]**.

Timed Reading The meter will automatically save measurement data periodically while measuring.

When you select Timed Reading, specify a time interval from 1 to 99 minutes. The default time interval is 10 minutes.

When measurement begins, the meter calculates and displays results as it normally does. When the set interval time elapses, the meter automatically stores the data and continues with the next measurement.

Read about Auto Delete before using this mode. See "Descriptions of the System Setup settings" on page 32.

To end a measurement run, press **[Cancel]** followed by **[Enter]**.

Auto-Lock Mode The meter will stop measuring when values stabilize enough to fall within the preset time.

Before performing a measurement in Auto-Lock reading mode, set the Auto-Lock conditions (see "Set Condition" on page 30). When the measurement begins, the meter automatically measures, calculates, and displays the results. Once the measurements meet the preset Auto-Lock condition, the measurement finishes and the screen displays the final readings.

You can view the calibrated parameter, calibrate the probe, save, or print results at any time during measurement. After measurement, you can save and print the results. Press **[Cancel]** to exit measuring mode or press **[Measure]** to begin the next measurement.

Set Condition

Use Set Condition to specify Auto-Lock parameters when measuring in the Auto-Lock measuring mode. An Auto-Lock measurement ends when all measured parameters meet the conditions set on this screen. For example, if the condition of **DO** is set to 1.0%, when the measured DO holds stable within a 1.0% tolerance for the set Auto-Lock time interval, the measurement ends and the screen locks displaying the final reading.

To set the conditions:

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12 on page 26.
2 Use the directional arrow keys to navigate to **Set Condition**.
3 Press [**Enter**] to select **Set Condition** or press [**Cancel**] to exit.
4 The **Set Condition** screen appears on the display. See Figure 15.

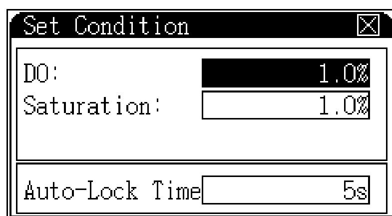


Figure 15 Setting a condition

5 Use the arrow keys to select a condition to edit. Press [**Setup**] to edit the value.
6 Enter the desired value. The Auto-Lock time has a range of 1–200 seconds.
7 Press **[Enter]** to save the new setup, exit, and return to the initial state. Press **[Cancel]** to exit without saving changes.

System Setup

The System Setup screen is where the user sets the time on the system clock, sets the calibration interval, and enters the information for the Good Laboratory Practices (GLP) standards.

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12 on page 26.

2 Use the directional arrow keys to navigate to **System Setup**.

3 Press [**Enter**] to select **System Setup** or press [**Cancel**] to exit.

The **System Setup** screen appears on the display. See Figure 16.

Figure 16 System Setup

4 Use the arrow keys to select a value to edit. Press [**Setup**] to edit the value.

5 Enter the desired value. See "Descriptions of the System Setup settings" on page 32 for more information.

6 If needed, edit the system date and time. To modify the date and time:

  a Use the arrow keys to highlight the Time field shown in Figure 16 on page 31 and press **[Setup].**

  b The **Set Date & Time** screen opens. This screen displays the current year, month, day, hour, minute, and second (see Figure 17). Press the arrow keys to highlight the proper cell, then press **[Setup]** to select it.

Set Date & Time

YY ---- MM ---- DD

2010 06 20

HH ---- MM ---- SS

09 17 49

Press SETUP Key to Set

Figure 17 Set Date & Time

  c Enter the correct value using the numeric key pad and press [**Enter**].

  d Once all changes are made, press [**Enter**] to save the settings and return to the **System Setup** screen.

7 Once all of the system settings are made, press **[Enter]** to save the new setup, exit, and return to the initial state. Press **[Cancel]** to exit without saving changes.

Descriptions of the System Setup settings

Calib Interval is the number of hours between the calibration messages that the Meter periodically displays as a reminder to recalibrate the probe. The meter begins counting the interval time from the end of the previous calibration. When the calibration interval has elapsed, the meter displays a popup window to remind the user to recalibrate the probe. A **Calib Interval** value of **0** disables the reminder.

Operator No is a three-digit number from 000–200 used to identify the person operating the meter. The **Operator No** is recorded every time the meter saves data.

When stored data reaches the meter's memory limit, **Auto Delete** allows you to automatically overwrite old data with new data. If **Auto Delete** is not enabled, the meter does not save new data when its memory is full. For example, the meter permits up to 200 sets of data. When you want to store the 201st set of data, if **Auto Delete** is on, meter will delete the first set of data and store the 201st data. If **Auto Delete** is disabled, the new data will not be stored.

CAUTION If **Auto Delete** is disabled, data can be lost.

Language select

This meter supports Chinese and English languages.

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12 on page 26.
2 Use the directional arrow keys to navigate to **Language Select**.
3 Press [**Enter**] to select **Language Select** or press [**Cancel**] to exit.
4 The **Language Select** screen appears on the display. Use the arrow keys to choose either **Chinese** or **English** and press [**Enter**].

To set the air pressure (barometric pressure)

You do not usually need to set barometric pressure. The default value is 101.3kPa.

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12 on page 26.
2 Use the directional arrow keys to navigate to **Air Pressure**.
3 Press [**Enter**] to select **Air Pressure** or press [**Cancel**] to exit.
4 The **Air Pressure** screen appears on the display. Enter the atmospheric pressure.

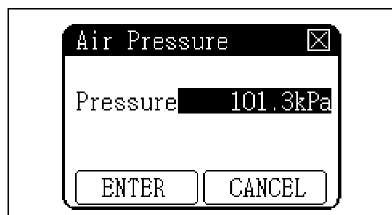


Figure 18 Set Air Pressure (barometric pressure)

To set the salinity value (SALI Value)

You do not usually need to set salinity. The default salinity value is 0.0 g/L.

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12 on page 26.

2 Use the directional arrow keys to navigate to **SALI Value**.

3 Press [**Enter**] to select **SALI Value** or press [**Cancel**] to exit.

The **SALI Value** screen appears on the display. Enter the salinity pressure.

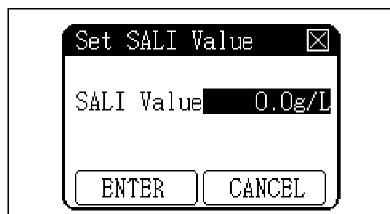


Figure 19 Set salinity value

Auto power off

The meter can power off automatically after a set time period. To set the **Auto Power Off** time:

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 12 on page 26.

2 Use the directional arrow keys to navigate to **Auto Power Off**.

3 Press [**Enter**] to select **Auto Power Off** or press [**Cancel**] to exit.

4 The **Auto Power Off** screen appears on the display. Enter a power down time from 10 to 480 minutes. Enter a time of 0 to disable **Auto Power Off**.

5 Press [**Enter**].

When the **Auto Power Off** time elapses after the start of a measurement, the meter shuts down. If the meter is connected to the Electrochemical Data Collecting Software, **Auto Power Off** is disabled.

Set Default

Use **Set Default** to reset the meter to is original factory settings.

1 From the initial state, press [**Setup**].
2 Use the directional arrow keys to navigate to **Set Default**.
3 Press [**Enter**] to select **Set Default** or press [**Cancel**] to exit.
4 The **Set Default** screen appears on the display. Press [**Enter**] to restore parameters to their original settings.

Table 2 Default values for meter parameters

Parameter	Default value
DO calibration data	Zero Oxygen: 0 nA Full Scale: 1000 nA Calibration temperature: 25.0 °C Calibrated Barometric Pressure: 101.3 kPa Calibrated Salinity: 0.0 g/L
Measuring mode	Continuous
Timed Reading Mode interval	10 minutes
Calib Interval	message disabled (0 hours)
Operator No	000
Auto Delete	Enabled
Auto-Lock Set Condition	DO 1.0% saturation 1.0%
Auto-Lock time	5 s
Auto Power Off	Disabled (0 minutes)

Prepare the DO Probe

1. Unscrew and remove the membrane cap.
2. Thoroughly rinse with distilled or deionized water.
3. Swing the membrane cap a few times to eliminate water drops.
4. Thoroughly rinse the silver and platinum parts of the stem with distilled or deionized water and dry it with a soft tissue.
5. Fill the membrane cap with DO filling solution to about 3/4 height.
6. Slowly screw the membrane cap onto the probe until finger tight. Ensure the membrane touches the platinum tip and there is no gas bubble between the membrane and the platinum tip.
7. Polarize the DO probe before use. Connect the DO probe with a powered-on 3200D DO meter. Polarization takes 60 minutes. The DO probe is always being polarized when connected with the meter, so there is no need to repolarize unless the DO probe has undergone maintenance or it has been disconnected from the meter for over 1 hour. If the DO probe is disconnected from the meter for less than 1 hour, polarize it for only 25 minutes before use.

To use the DO probe

Stirring

Some oxygen is consumed during measurement, so oxygen concentration becomes low near the membrane. The sample solution near the membrane must be refreshed, either by swinging the probe horizontally at the rate of 20–80 cm/s, or by using a stirrer to maintain consistent flow of the sample solution to the sensitive membrane.

DO filling solution

The DO probe should be refilled with new DO filling solution after a certain period of operation, depending upon application conditions. Refill the DO filling solution every 2 weeks to 2 months.

CAUTION

There should not be any damage to the membrane. Avoid touching the membrane to any solid or hard materials. Ensure the membrane touches the platinum tip and there is no gas bubble between the membrane and the platinum tip. If there is any damage to the membrane, change to a new membrane cap.

Calibrate the DO Probe

To obtain accurate measurements, calibrate the DO probe before use. The meter can perform a Zero Point Calibration and a Full Scale Calibration.

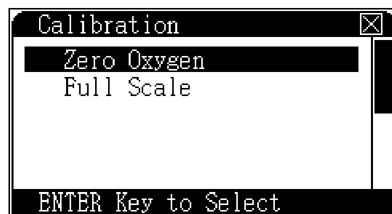


Figure 20 Calibrating the probe

Zero oxygen calibration (Calib Zero)

1 Rinse the DO probe with distilled water and put it in a zero oxygen solution (5% sodium sulfite solution or as described in the instruction manual for the DO probe).
2 From the initial state or while measuring, press **[Calibrate]**.
3 Select **Calib Zero**. Press **[Enter]** to select Zero Point Calibration as shown in Figure 21. During calibration, press **[Setup]** to set calibration parameters such as barometric pressure and salinity. Press **[Cancel]** to end calibration.

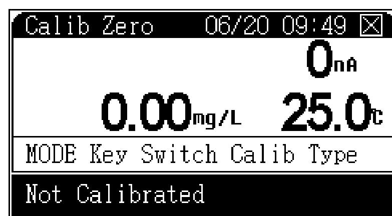


Figure 21 Zero Oxygen calibration

4 When reading becomes stable, press **[Enter]** to automatically record the Zero Point value. This ends calibration.
5 Press **[Cancel]** to finish calibration.

Full scale calibration (Calib Full)

1 Take the DO probe out of solution and thoroughly rinse it with distilled water.
2 Dry it with a soft tissue on the membrane surface.
3 To calibrate with air, put the probe in a well-ventilated area. Otherwise, calibrate with water saturated with air.
4 Swirl the probe at a speed of 20–80 cm/s or stir the solution to produce a similar linear speed near the membrane. Keep the flow speed constant during calibration. Ensure there is no air bubble trapped under the membrane.
5 From the initial state or while measuring, press **[Calibrate]**.
6 Select **Full Scale**. Press **[Enter]** to open Full Scale Calibration as shown in Figure 22. During calibration, press **[Setup]** to set calibration parameters such as barometric pressure and salinity.

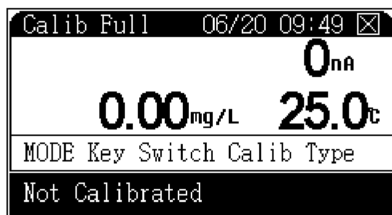


Figure 22 Calib Full

7 When reading becomes stable, press **[Enter]** to automatically record the Full Scale response. This ends Full Scale Calibration.
8 Press **[Cancel]** to finish calibration.

Perform another calibration

After performing a calibration, the meter displays a prompt asking if another calibration is wanted. For instance, after Zero Point Calibration, the meter will ask if a Full Scale Calibration is wanted, and vice versa. During calibration, press **[Mode]** to switch between Zero Point Calibration and Full Scale Calibration.

Perform a Measurement

During measurement, make sure the tip of the probe is completely submersed in the solution. Place the probe in a location where the solution can flow freely around the measuring tip.

To measure DO

1 When the DO probe is used for the first time, rinse it with distilled water and put it in sample solution.

2 Calibrate the meter. See "Calibrate the DO Probe" on page 39.

3 From the initial state display, press **[Setup]** and select a measuring mode and the DO parameter. See "Measuring Mode" on page 26.

4 Put the probe in the sample solution and press **[Measure]** to start taking a measurement according to the selected mode. See Figure 23. The upper area of the screen shows the current measuring mode and system time. The central area of the screen shows DO data, the corresponding DO current value, and temperature. The bottom area shows the most recent calibration data.

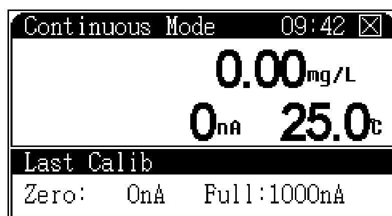


Figure 23 The Measurement Mode display

The measuring and display methods vary slightly with different measuring modes. During measurement, you can calibrate the probe and reset the parameter. After measurement, you can save and output measuring data.

5 After a measurement, press [**Save**] to save data. Press [**Output**] to print data. Press [**Cancel**] to end measurement.

To measure saturation

1 When the DO probe is used for the first time, rinse it with distilled water and put it in sample solution.

2 Calibrate the meter. See "Calibrate the DO Probe" on page 39.

3 From the initial state display, press **[Setup]** and select a measuring mode and the SATU parameter. See "Measuring Mode" on page 26.

4 Put the probe in the sample solution and press **[Measure]** to start taking a measurement according to the selected mode.

5 After a measurement, press [**Save**] to save data. Press [**Output**] to print data. Press [**Cancel**] to end measurement.

To measure temperature

In any measuring state, the meter directly displays current solution temperature.

To view other parameters while measuring

During a measurement, the user still can view other parameter not currently in use without changing the operational mode. For instance, while measuring with the **DO** parameter, a user can view, save, and print the **SATU** parameter.

1 While performing a measurement, press **[Mode]**. The screen display highlights the measuring window as shown in Figure 24.

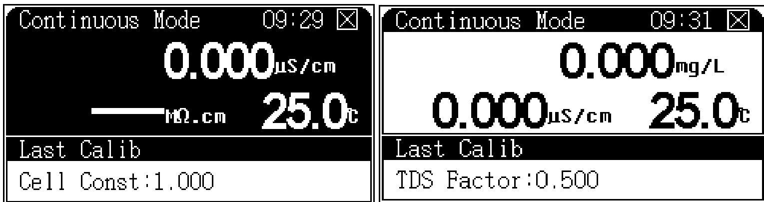


Figure 24 Viewing parameters while measuring

2 Press **[4/◀]** or **[6/▶]** to switch the view to the other parameter.

3 If you do not press a key for a few seconds, the meter will automatically exit from viewing mode and return to the regular initial screen.

Managing Data

To save data

The Agilent 3200D Dissolved Oxygen Meter can save 200 sets of data. The procedure to save data varies with different measuring modes.

- In continuous mode and Auto-Lock reading mode, press **[Save]** to save data when readings become stable.
- In timed reading mode, you can still save data manually, but the meter automatically saves measuring data at a fixed periodic time interval. See "Measuring Mode" on page 26.

To delete data

You can delete individual data entries or delete all data at once.

1 In either the initial screen or while measuring, press [**View**].
2 Select the data and press [**Delete**].

To output data

You can output current measuring data, the most recent calibration data, or saved data. Control the data output from the connected software.

To view data

The Agilent 3200D Dissolved Oxygen Meter allows you to view parameters such as the last calibration data and current parameter. It also allows you to set the parameter directly and view saved data. The meter stores data according to the parameter measured. All saved data meets GLP standards. The meter can store 200 sets of measurement data.

1 In the initial state, press **[View]**.

2 Navigate to the type of data to view and press **[Enter]**. See Figure 25.



Figure 25 View selection

To View DO Data

The meter stores data according to the parameter measured. All saved data meets GLP standards. The meter can save 200 sets of concentration or saturation data.

1 In the initial state, press **[View]** and select **View Saved DO**. See Figure 26.

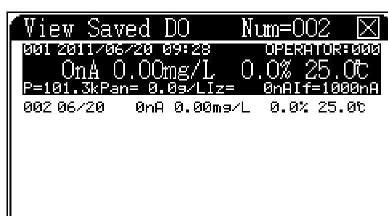


Figure 26 Viewing saved data

The upper area shows the present viewing mode and actual

storage amount. Each page can display up to 10 saved data. The display format depends on the viewing mode.

2 The data displayed include **save time** and **operator no**. Press the arrow keys to scroll through the saved data.

3 Press **[Delete]** to delete data.

4 To output stored data, connect the PC with the meter (see “To output data” on page 44.) and press **[Output]**. See Figure 27 on page 47 for the output format.

```
========================
MODEL
                   3200D
        DISSOLVED OXYGEN
                   METER
SOFTWARE
                VER 1.00
PRINT TIME
                09:03:28
              2010/06/20
OPERATOR NO
                     000
************************
STORED NUM:          002
************************
                  NO:001
OPERATOR NO:         000
STORED TIME:    10:43:00
              2010/06/20
PRESSURE:       101.3kPa
SALINITY:         0.0g/L
ZERO:                0nA
FULL :            1000nA

CURRENT:             0nA
DO:             0.00mg/L
SATURATION:         0.0%
TEMP:              25.0c
************************
                  NO:002
OPERATOR NO:         000
STORED TIME:    10:43:00
              2010/06/20
PRESSURE:       101.3kPa
SALINITY:         0.0g/L
ZERO:                0nA
FULL:             1000nA

CURRENT:             0nA
DO:             0.00mg/L
SATURATION:         0.0%
TEMP:              25.0c
========================
```

Figure 27 Output format

To View the Last Calib

1 In the initial state, press **[View],** select **Last Calib Data**, and then press **[Enter]**. The display is shown in Figure 28. The upper area displays last calibration data. The bottom area displays current calibrated parameters.

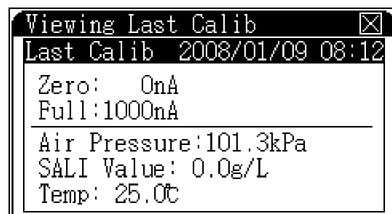


Figure 28 Viewing Last Calib

2 To print current data, connect the meter with the PC. Press **[Output]** to print data. See “To output data” on page 44 for more information. See Figure 29 on page 49 for the output format.

```
========================
MODEL
                   3200D
        DISSOLVED OXYGEN
                   METER
SOFTWARE
                VER 1.00
PRINT TIME
                09:14:03
              2010/06/20
OPERATOR NO
                     000
************************
DO CALIB DATA
CALIB TIME:     08:12:00
              2008/01/09
OPERATOR NO:         000

PRESSURE:       101.3kPa
SALINITY:         0.0g/L
ZERO:                0nA
FUL:      1000nA
TEMP:              25.0c
========================
```

Figure 29 Output format

Turn off the 3200D Dissolved Oxygen Meter

1 Before turning off the meter, save any data that you want to keep. See "To save data" on page 44.

2 Press **[On/Off]** to turn off the meter.

When not in use, all probes should be soaked in distilled water. If the meter is out of use for a long time, check the following:

- Disconnect the power adaptor from the power line to avoid damaging the adaptor and the meter.
- The socket of the meter must be kept clean and dry. Avoid contact of the socket with acid, alkaline and salt solution.
- The input terminal of the meter (connector of the DO/ATC probe) must be kept clean and dry. If the DO probe is used in a strongly humid place, wipe the DO probe plug with clean gauze.
- If the DO probe is not used, store it in distilled water. Do not soak it in sodium sulfite solution. If the sodium sulfite solution leaks into the DO probe chamber, the probe performance will deteriorate.
- Unscrew the membrane cap and empty the filling solution.
- Rinse the cathode and anode components with distilled water and then dry with a soft tissue.
- Store the DO probe in a dry place.
- For a new DO probe, a DO probe refilled with new DO filling solution, or a DO probe with a new membrane cap, polarize the DO probe for more than one hour before use.

Software Operation

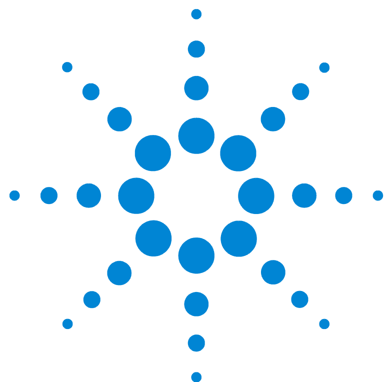
See also "Installing Optional Software" on page 14.

To use the optional G4390A Electrochemical Data Collecting software

1 Connect the meter to the power adapter.
2 Press **[On/Off]** to turn on the meter.
3 Connect the meter to the computer using the USB cable.
4 Run the Electrochemical Data Collecting Software in the computer and the software will recognize the meter model and type. The software provides the functions corresponding to the meter type. Refer to the software documentation for details.

To use the Data Printing software

1 Connect the meter to the power adapter.
2 Press **[On/Off]** to turn on the meter.
3 Connect the meter to the computer using the USB cable.
4 Launch the printing software.
5 With the meter taking measurements or when viewing calibration data or stored data, press **[Output]**. The software receives the data. Once received, print the data as desired. For details, refer to the Data Printing software documentation.



3
Troubleshooting and Maintenance

This chapter describes how to verify whether the meter is working properly and how to maintain the meter.

Troubleshooting the 3200D Dissolved Oxygen Meter

Table 3 lists common problems, possible causes, and how to resolve them.

Note that improper operation of the DO probe causes abnormal readings. During measurement, soak the probe tip completely in solution.

Table 3 3200D Troubleshooting

Number	Failure mode	Failure cause	Solutions
1	No display after meter starts up. The display is not lit up.	**1** Power adaptor not installed correctly. **2** The power supply does not meet with the requirements. **3** The power adaptor is damaged. **4** The power socket has poor contact. **5** The LCD is damaged (After start up for a few minutes, the user can hear a buzzing sound after pressing **[On/Off]** key, but there is no display on LCD.)	**1** Reconnect. **2** Use the required power supply. **3** Replace the power adaptor. **4** Ensure there is a good contact. **5** Contact Customer Service.
2	Display is dim.		Check the power adapter.
3	No buzzing when pressing key	**1** You may have pressed invalid keys under the current setup. **2** The buzzer has been damaged.	The buzzer only sounds when you press a valid key.
4	No response when pressing key	**1** You may have pressed invalid keys under the current setup. **2** The key has been damaged.	Press the valid key for operation.

Table 3 3200D Troubleshooting (continued)

Number	Failure mode	Failure cause	Solutions
5	The reading is not stable for a long time.	**1** The probe has been damaged or aged. **2** There is strong electrical signal interference source nearby (electrical leaking, strong electromagnetic field, an so forth).	**1** Replace the probe. **2** Remove the electrical signal interference source. Lift or move the beaker away from the source of interference. Shield the meter and beaker from the electromagnetic field. Use a ground wire with one terminal connected to the meter and the other terminal connected to the interference source.

General Troubleshooting Procedure

During use, there are many factors that may impact measurement results, including the probe, the standard solutions used to calibrate the probe, the sample solution, ambient temperature during measurement, the stirring rate, incorrect operation, and parameter setup. When the measured results are significantly different from what is expected, first determine whether the meter itself or factors other than the meter caused the error. Follow the suggestions described below to diagnose the problem. You will need to diagnose the meter based on your application conditions. For best results, follow the troubleshooting order shown below.

Check the current response

1. Connect the meter to the ATC temperature diagnostic tool (5185-8390) shipped with the meter.
2. Turn on the meter.
3. Enter the measurement state. At this moment, the meter should display a current between 680 to 720 nA. When the ATC temperature diagnostic tool (5185-8390) is disconnected, the meter should display a current between 0 to 5 nA. If yes, the DO measurement of this meter is functioning well. If the display deviates significantly from these values, there is a problem with the meter. Contact Agilent service.

Check the DO probe

Generally, after the meter is connected to a DO probe for a period of time, the current for the DO probe in air should be at a stable value ranging from 300 to 1000 nA (refer to DO probe manual for details). If not, there is some problem with the DO probe.

Check the temperature measurement

1 Connect the meter to the ATC temperature diagnostic tool (5185-8390) shipped with the meter.
2 Turn on the meter to enter into the measurement state. With the ATC temperature diagnostic tool connected, the meter should display a temperature reading between 49.0 to 51.0 °C. If yes, the meter is correctly measuring temperature. If the meter displays a temperature reading significantly different from 50 °C, there is a problem with the meter. Contact Agilent service.

Check other possible causes

If the meter is functioning properly, that is, the meter and probe passed the above tests, check for other possible problems by comparing readings from different standard solutions. Put the DO probe in different, fresh standard solutions. Check the current values measured. Based on the comparison, judge whether the problem resulted from the probe, the sample solution, or something else. Also consider the stirring rate used during DO measurement. The stirring rate can impact measurement results.

Meter Self-Diagnostics and Messages

The meter supports self-diagnosis, which can find some common errors caused by meter, probe, solution, or operation. It deals with these errors differently according to their severity.

There are two levels of severity:

Severe system errors hinder further use of the meter or make the meter unable to finish necessary tasks. In this case, replacement or maintenance of the meter is required.

Minor errors, which are prompts or warnings, are caused by various reasons and can be corrected in several ways. However, you must pay attention to these errors to ensure measurement integrity and reliability. If you ignore these error messages the operation can continue.

Severe errors

When severe errors occur in the meter, the meter will shut down and display an error message similar to Figure 30. In this case, the only operation that can be performed is to turn off the meter.

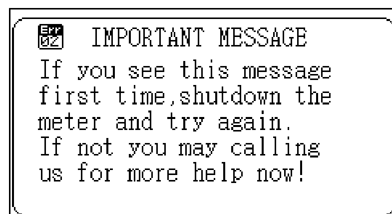


Figure 30 Severe errors

Error warning

Error warnings indicate improper probe installation, solution problems, and probe setup during use. Read these error warnings carefully. Proper maintenance and operation will reduce errors.

Figure 31 shows an example error warning that temperature is out of range.

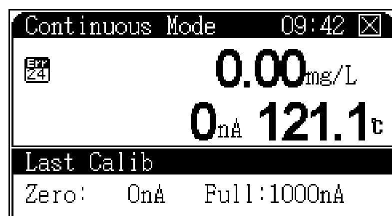


Figure 31 Error warning



is the error warning icon. The icon includes the error code.

NOTE This table describes all error messages which may occur in use. These error messages have different definition for different meters

Table 4 Error warning codes

Code	Description	Solution	Memo
00	Conductivity measuring module error	Contact Customer Service.	Serious error
01	DO measuring module error	Contact Customer Service.	Serious error
02	Temperature measuring module error	Contact Customer Service.	Serious error
03	Data storage error	Contact Customer Service.	Serious error
20	Potential is out of range	Replace electrode.	–1999.9 to 1999.9 mV
21	pH/pX is out of range	Replace electrode.	–3.000 to 21.000 pH

Table 4 Error warning codes (continued)

Code	Description	Solution	Memo
22	Conductivity is out of range	Replace probe and solution.	0 to 2000 mS/cm
23	Resistivity is out of range	Replace probe and solution.	0 to 100 MΩ• cm
24	Temperature is out of range	Replace electrode and decrease solution temperature.	–6.0 to 120.0 °C
25	DO electric current is out of range	Replace probe.	0 to 4000 nA
26	pH electrode slope is out of range	Replace electrode and recalibrate it.	80 to 120 %
27	Failed to recognize pH buffers	Replace electrode, setup proper buffer group and replace buffers.	
28	Temperature of pH buffer is out of range	Cool or heat buffer.	
29	Calibrate the same buffer repeatedly	Replace the buffer.	Due to incorrect operation
30	Number of pH buffers exceeds maximum.	Remove one or more buffers from the group.	5 buffers at most
31	pH buffers conflict with each other	Remove one or more buffers with overlapping pH values.	
32	The data storage is full.	Overwrite the previous data and store new data.	Do not delete all data.
33	The internal clock has a low battery.	Set the time manually.	
34	Number of customer-defined ions exceeds maximum	Delete one or more unnecessary customer-defined ions.	
35	The maximum ion mode number stored	Delete all storage data of certain ion mode.	

Maintenance

This section describes how to maintain and store the probe.

Probe maintenance

1. Disconnect the probe from the meter.
2. Unscrew the membrane cap.
3. Empty the membrane cap.
4. Rinse thoroughly with distilled or deionized water, then swing the membrane cap for a few times to eliminate water drops.
5. Rinse the silver and platinum parts of the stem with distilled or deionized water and dry with a soft tissue.

Short term storage

Between tests, immerse the measuring tip in distilled water or calibration solution while the probe is connected to the meter.

Long term storage

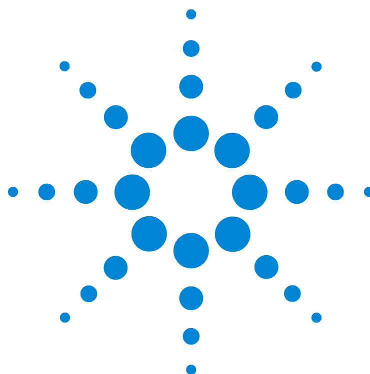
1. Disconnect the probe from the meter.
2. Unscrew the membrane cap.
3. Empty the membrane cap.
4. Rinse the membrane cap with distilled or deionized water.
5. Swing the probe a few times to throw away water drops.
6. Dry the silver and platinum parts of the stem. Screw the membrane cap back (without adding any DO filling solution). Store the probe in a dry place at ambient temperature.

Consumables and Ordering Information

Table 5 Consumables and replacement parts

Order No.	Model and name	Description
G4388A	3200SA Stirrer	Electrode holder and magnetic stirrer: combined to stir solution with stable and precise speed with a large adjustable range.
G4389A	3200EA Electrode Holder	It is used to support several electrodes.
5185-8389	AC Adaptor	100–240VAC, 1A, 50/60Hz
G4388-27000	Stirring Bar	It is used with stirrer.
5190-3997	D6111 DO Probe	Plastic body, polarographic probe with built-in ATC probe, (with DO filling solution and membrane kit *3), Measuring range: 0–20 mg/L, 0–45 °C
5190-0547	DO Filling Solution	Bottles, 3 x 30 mL
5190-0548	DO Membrane Kit	3 pieces/kit
5185-8390	ATC temperature diagnostic tool	For troubleshooting temperature problems

Log onto the portal at http://www.agilent.com/chem for detailed information.



Agilent 3200D 溶解氧测定仪

用户手册



Agilent Technologies

声明

手册部件号

5973-1779

版本

第一版，2012 年 3 月

中国印刷

安捷伦科技（上海）有限公司
上海市浦东新区外高桥保税区
英伦路 412 号

联系电话：（800）820 3278

担保说明

本手册内容按 " 原样 " 提供，在将来的版本中如有更改，恕不另行通知。此外，在使用法律允许的最大范围内，Agilent 对本手册以及此处包含的任何信息不作任何明示或暗示担保，包括但不仅限于适销性针某一特殊用途的实用性的暗示担保。对于因提供、使用或执行本手册或此处包含的任何信息而产生的错误，或造成的偶然或必然的损失，Agilent 不承担任何责任。如果 Agilent 与用户签订了单独的书面协议，而其中涉及本手册内容的担保条款与这些条款存在冲突，则以协议中的担保条款为准。

安全声明

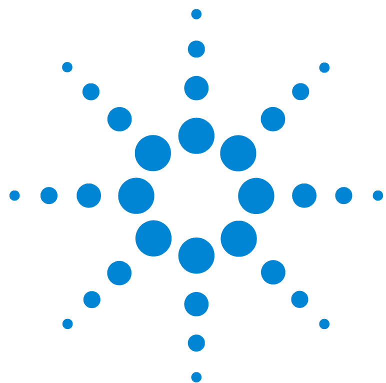
小心

小心提示表示存在危险。提醒您注意某个操作步骤、某项操作或类似问题，如果执行不当或未遵照提示操作，可能会损坏产品或丢失重要数据。只有完全理解并符合指定的条件时，才可以忽略小心提示的要求继续进行操作。

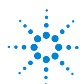
警告

警告提示表示存在危险。提醒您注意某个操作步骤、某项操作或类似问题，如果执行不当或未遵照提示操作，可能会导致人身伤害或死亡。只有完全理解并符合指定的条件时，才可以忽略警告提示的要求继续进行操作。

目录



1
3200D 型溶解氧测定仪安装指南



安装所需的工具和部件

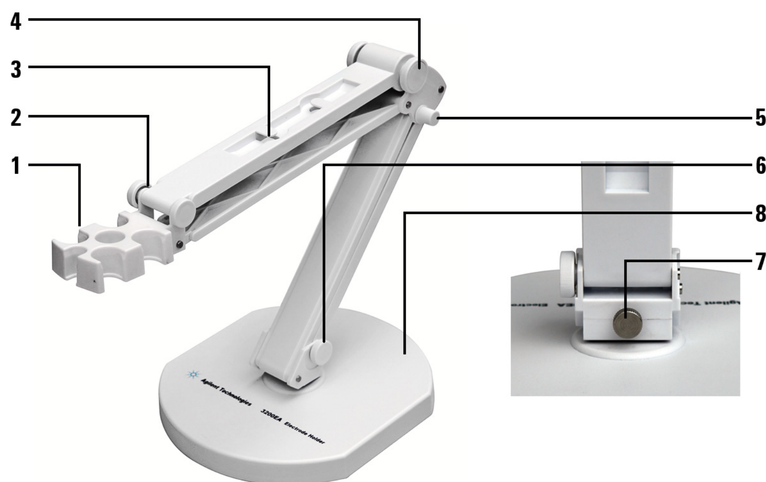
Agilent 提供安装所需的所有专业工具，在溶解氧测定仪 (套装) 装运包装箱中可找到以下部件：

- 电极支架 (G4389A)
- 电极 (D6111 DO Probe 5190-3997)
- 电源适配器 (5185-8389)

3200D 型溶解氧测定仪安装

打开 3200D 型溶解氧测定仪包装（套装），取出溶解氧测定仪、电极支架以及相关附件。

电极支架的安装



1. 电极插孔

2. 紧固螺母

3. 电极线固定孔

4. 紧固螺母

5. 紧固螺母

6. 紧固螺母

7. 紧固螺母

8. 底座

电化学传感器的安装

在溶解氧测定仪的背面找到溶解氧 / 温度接口、然后，分别将溶解氧电极 （5190-3997）插入溶解氧 / 温度接口内，并将电极线夹在电极支架边缘固定孔中。注：溶解氧电极已包含温度电极。





电源适配器的安装

仪器随机提供电源适配器。请注意，本适配器只适用于本仪器，不建议使用于其他类型的仪器。我们也不建议使用其他类型的电源适配器。

本电源适配器适用于以下电源：100–240 VAC， 1 A， 50/60 Hz。

对应不同地区的电源，电源适配器提供多种转接插头，用户请正确选择合适的电源插头，然后按照图示将电源插头安装到适配器底座上，听到“啪”的一声表示已经安装到位。



接地线的安装

仪器随机提供接地线，但是接地线在测量过程中不是必须安装的。有时电极和被测溶液组成的测量部分会受到某些设备的干扰（如恒温槽等设备），从而引起跳字、影响测量，此时必须将测量部分屏蔽起来，并安装接地线，消除干扰。当仪器受到干扰时，将 DC501 接地线一端连接仪器，另一端连接测量部分的屏蔽层，比如恒温槽的外壳等。

安装电化学数据采集软件和数据打印软件

电化学数据采集软件是为了方便用户使用而开发的一套数据采集软件 (本软件 G4390A，需要另外购买)。如果用户有需要，请选择安装。

溶解氧测定仪安装好后，在计算机上安装电化学数据采集软件，本软件采用 USB 接口，可实现与计算机通讯。请参阅随机附带的电化学数据采集系统软件的安装说明。

如果用户需要将仪器测量数据、存贮数据以及标定参数打印出来，可以选择安装数据打印软件，软件支持接收仪器发送的数据并可将数据打印出来，本软件免费提供给用户。具体请参阅数据打印软件的安装说明。

获得更多信息

溶解氧测定仪、数据采集软件和数据打印软件的安装现在已经完成。有关更多信息，请参阅：

- 3200D 型溶解氧测定仪操作指南，以获得和熟悉日常操作说明。
- 电极操作指南，以获得电极使用和维护说明。



2
3200D 型溶解氧测定仪操作指南

此文档提供对组成 3200D 型溶解氧测定仪的各个组件的概述。



简介

在哪里可以获得相关信息

除此文档之外， Agilent 还提供了其他相关说明产品，这些产品描述如何安装、操作和维护 3200D 型溶解氧测定仪及其故障排除。

使用溶解氧测定仪之前，请确保已阅读 3200D 型溶解氧测定仪安装指南和操作指南。使用溶解氧测定仪时最常见的安全问题有：

- 如果选用非原机配备电源适配器可能会发生不必要的安全问题。
- 必须有良好的接地。
- 防止腐蚀性气体侵入。
- 仪器的插座必须保持清洁、干燥，切忌与酸、碱、盐溶液接触。
- 仪器可供长期稳定使用。测试完样品后，应将电极储藏于煮沸冷却后的蒸馏水中，切忌将电极浸入亚硫酸钠溶液中，因为上述溶液一旦渗透到电极腔体内，会影响电极性能。
- 新装电解液和薄膜后，需要极化 60 分钟后才能使用。

Agilent 客户门户网站

Agilent 建立了一个客户门户网站，可为您所拥有的产品提供相关自定义信息。通过该 Web 服务，您可以使用多种自定义服务以及与 Agilent 产品和订单直接相关的信息。该门户网站的登录地为 http://www.agilent.com/chem。

术语解释

溶解氧浓度：在一定条件下，溶解于水中分子状态的氧的含量。用每升水中氧气的毫克数表示。通常记作 DO。

溶解氧饱和度：实际溶解氧浓度与相同条件下饱和溶解氧浓度的比值。

大气压：现场大气压力。用 kPa 表示。

盐度：水中含盐量。用 g/L 表示。

零点标定：在 “ 无氧水 ”（新鲜配制的 5% 亚硫酸钠溶液）中对电极进行标定。

满度标定：在空气或空气充分溶解饱和水中对电极进行标定。

3200D 型溶解氧测定仪的特点

3200D 型溶解氧测定仪是一台新颖、实用的实验室分析仪器，适用于实验室精确测量水溶液的溶解氧浓度值、溶解氧饱和度，也可用于测量水溶液的温度，其主要特点为：

- 支持测量溶解氧浓度、溶解氧饱和度、温度值。
- 支持标定功能，用户可以标定零氧、满度。
- 采用点阵式液晶，显示清晰，外形美观。具有良好的人机界面，操作方便。
- 支持 GLP 规范：
  - 仪器要求设置操作者编号并记录；
  - 记录并允许查阅、打印标定数据；
  - 支持贮存符合 GLP 规范的测量数据 200 套。
- 允许查阅、打印、删除贮存的测量数据。
- 支持三种测量模式：连续测量模式、定时测量模式和平衡测量模式，满足用户的不同测量需要。
- 具有 USB 接口，配合专用的通信软件，可以实现与 PC 的连接。
- 具有断电保护功能，在仪器使用完毕关机后或非正常断电情况下，仪器内部贮存的测量数据、标定数据以及设置的参数不会丢失。
- 仪器支持自动关机功能。
- 仪器支持恢复默认数据功能；支持自诊断，可以诊断仪器是否正常工作。
- 带有背光设计，可以在阴暗的环境下使用。
- 采用新型材料 PC 面板，轻触按键设计，可靠性好，寿命长。
- 仪器具有固件升级功能，当仪器有功能性的拓展或者软件本身存在 bug 时，仪器可以使用本功能更新。

3200D 型溶解氧测定仪的主要技术性能

3200D 型溶解氧测定仪的主要技术性能包括测量范围、分辨率、电子单元基本误差、仪器正常工作条件以及外形尺寸和重量。

测量范围

- 溶解氧浓度：0.00 ～ 45.00 mg/L；
- 溶解氧饱和度：0.0 ～ 300.0%；
- 温度：-5.0 ～ 110.0°C。

分辨率

- 溶解氧浓度：0.01 mg/L；
- 溶解氧饱和度：0.1%；
- 温度：0.1°C。

电子单元基本误差

- 溶解氧：±0.10 mg/L；
- 溶解氧饱和度：±2.0%；
- 温度：±0.1°C。

仪器正常工作条件

- 环境温度：0 ～ 40°C；
- 相对湿度：不大于 85%；
- 供电电源：电源适配器 (5185-8389，输入：100 ～ 240 VAC，1 A；输出：9 VDC， 1 A)；
- 周围无影响性能的振动存在；
- 周围空气中无腐蚀性的气体存在；
- 周围除地磁场外无其他影响性能的电磁场干扰。

外形尺寸 (长 × 宽 × 高， mm)：190×190×105

重量 (kg)：约 1 kg。

使用溶解氧测定仪的方法

溶解氧测定仪主要用来测量水溶液的含氧量。

使用溶解氧测定仪测量溶液的含氧量需要进行 3 个主要步骤。它们是：

- 功能设置
- 电极标定
- 溶解氧的测定



显示 3200D 型溶解氧测定仪的状态消息，而且可以通过操作键盘相对应的按键更改用户的参数设置。3200D 型溶解氧测定仪由电子单元和电极系统组成，电极系统由溶解氧测量电极（包含温度测量电极）构成。一切以实际的装箱单为准。下面将描述每个部分。

3200D 型溶解氧测定仪的前视图



1. 显示屏
2. 按键

3200D 型溶解氧测定仪的后视图



1. 接地
2. 溶解氧电极接口
3. USB 接口
4. 电源接口

操作盘

操作盘由显示屏和操作键盘组成。

显示屏

显示屏显示 3200D 型溶解氧测定仪上目前正在执行的活动和工作状态。仪器正确连接电源后，按 “On/Off” 键打开仪器，仪器将显示公司名称、仪器型号、版本号等信息，并开始系统自检，完成后进入仪器的起始状态，仪器的起始状态显示如图，其中显示屏左面显示有当前的系统时间；右面为当前设置好的测量模式、测量参数以及上次的标定结果。

模式&参数
09:37
2010/06/20
连续测量模式
测量 溶解氧
零氧: 0nA
满度:1000nA

操作键盘

3200D 型溶解氧测定仪有 15 个操作按键，分别为：1/ 输出键、2/ ▲键、3/ 贮存键、4/◀ 键、5/ 设置键、6/▶ 键、7/ 查阅键、8/ ▼键、9/ 模式键、0/ 测量键、·/ 标定键、-/ 删除键、确认键、取消键、开 / 关键等。除确认键、取消键外，其余都为双功能键，分别介绍如下。

1/ 输出键：输入数字 “1” ；在查阅贮存数据或标定数据时输出贮存数据或标定数据；

2/ ▲键、4/◀ 键、8/ ▼键、6/▶ 键：输入数字 “2”、“4”、“8”、“6” ；方向键，用于选择菜单等；

3/ 贮存键：输入数字 “3” ；测量时贮存测量结果；

5/ 设置键：输入数字 “5” ；在不同的操作情况下设置不同的功能；

7/ 查阅键：输入数字 “7” ；查阅贮存数据或标定数据；

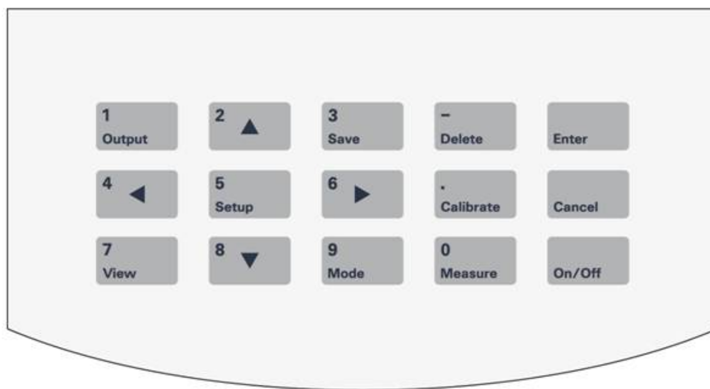
9/ 模式键：输入数字 “9” ；测量状态下用于切换显示窗口或参数；

0/ 测量键：输入数字 “0” ；在仪器的起始状态开始测量；

·/ 标定键：输入小数；标定电极；

-/ 删除键：输入负数；清除全部输入；在查阅贮存数据时可以删除贮存的数据。

开 / 关键：打开或者关闭仪器。



操作基本知识

使用 3200D 型溶解氧测定仪时可以执行的任务。

概述

操作溶解氧测定仪涉及下列任务：

- 启动 3200D 型溶解氧测定仪。
- 功能设置。请参阅 " 起始状态下的功能设置 "。
- 溶解氧电极的准备。请查阅 " 电极的准备 "。
- 电极的标定。请参阅 " 电极的标定 "。
- 溶解氧的测量。请参阅 " 溶解氧的测量方法 "。
- 饱和度的测量。请参阅 " 溶解氧饱和度的测量方法 "。
- 温度的测量。请参阅 " 温度的测量方法 "。
- 数据贮存。请参阅 " 数据贮存功能 "。
- 数据删除。请参阅 " 数据删除功能 "。
- 数据输出功能。请参阅 " 数据输出功能 "。
- 查阅功能。请参阅 " 查阅功能 "。
- 关闭 3200D 型溶解氧测定仪。请参阅 " 关闭 3200D 型溶解氧测定仪 "。

仪器控制

3200D 型溶解氧测定仪通常直接由操作按键控制。此外，3200D 溶解氧测定仪可以通过电化学数据采集软件与计算机通讯。仪器还可以通过数据打印软件将测量数据、标定数据、存贮数据等打印出来。

启动 3200D 型溶解氧测定仪

首先要正确地安装和维护溶解氧测定仪。开机前 , 须检查电源是否接妥 , 应保证仪器良好接地。电极的连接须可靠 , 防止腐蚀性气体侵袭。仪器插入电源后，按 "On/Off" 键开机。

起始状态下的功能设置

仪器的起始状态显示如图 1，其中显示屏左面显示有当前的系统时间；右面为当前设置好的测量模式、测量参数、以及上次的标定结果。



图 1

在起始状态，按 " 设置 " 键可以设置 " 设置测量模式 "、" 设置平衡条件 " 以及 " 系统设置 "、" 设置语言 "、" 设置大气压 "、" 设置盐度 "、 " 设置自动关机 "、 " 恢复默认设置 " 等。按 " 设置 " 键，仪器显示设置菜单，显示如图 2。

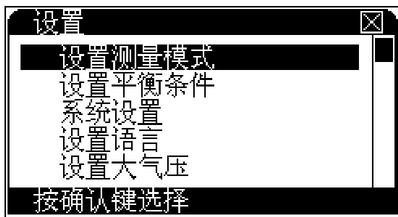


图 2

仪器突出显示当前的菜单项，用户可以按方向键选择合适的菜单项，按 " 确认 " 键选择相应的功能模块；按 " 取消 " 键退出功能菜单选择。" 设置测量模式 "：设置当前的测量模式（连续测量模式、定时测量模式、平衡测量模式）以及需要测量的测量参数； " 设置平衡条件 "：设置平衡测量模式下的平衡条件； " 系统设置 "：设置系统时间、GLP 选项； " 设置语言 "：本仪器支持中、英文版本；" 设置大气压 "：设置大气压值； " 设置盐度 "：设置盐度值； " 设置自动关机 "：仪器具有自动关机功能，用户可以设置自动关机时间； " 恢复默认设置 " 允许用户恢复测量参数至默认值，方便仪器自诊断。

设置测量模式

仪器支持三种测量模式，包括连续测量模式、定时测量模式、平衡测量模式。

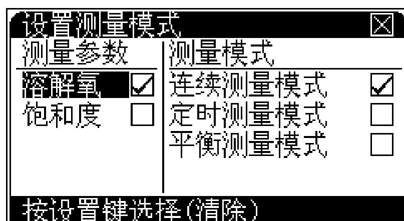


图 3

用户选择了相应的参数以及测量模式后，下次测量时即可按照当前设置情况进行测量。

在实际测量中，虽然用户选择了某个测量参数，仪器仍然允许用户随时查看其他参数值。譬如，溶解氧这个参数，在测量时，用户还是可以随时查看、存贮、打印其它参数值，如饱和度、电极电流等。

按“设置”键，再按“确认”键后，即可设置测量模式，显示如图 3，

其中左面为测量参数列表，包括溶解氧、饱和度；右面为测量模式列表，包括连续测量模式、定时测量模式、平衡测量模式；显示“√”的表示为当前选中的测量参数或者测量模式；突出显示的表示可操作的当前项；按方向键移动到合适的项目后，按“设置”键选择（或清除）当前项目。按“确认”键，仪器自动保存当前的所有设置，返回起始状态；按“取消”键仪器放弃当前设置返回起始状态。图 4 即为选择某个测量参数后实际测量显示图。



图 4

为了方便用户随时查看各个模块里面其它的参数值，仪器设置了一个特别的查看功能。在测量状态下，按“ 模式 ”键，仪器即突出显示测量窗口，如图 5，重复按“4/◀”或“6/▶”键，可以查看其他测量参数，比如，当前测量参数为溶解氧参数，则重复按“4/◀”或“6/▶”键时，仪器会在溶解氧、饱和度、电极电流之间来回切换。查看结束，如果用户在几秒钟里面没有继续按键，仪器会自动退出查看状态。

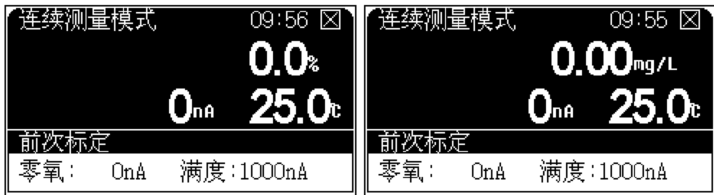


图 5

连续测量模式 这是最常使用的一种测量模式，开始测量后，仪器始终连续测量、计算和显示测量结果，用户在测量期间可以查阅测量参数、标定电极、贮存或打印测量结果等等，测量结束，用户按“ 取消 ”键并“ 确认 ”后退出测量模式。

定时测量模式 定时测量模式是为了方便用户检测需要而设置的，比如需要连续 30 分钟检测溶解氧浓度值，则用户可以选择这种定时测量模式，开始测量后，仪器会自动测量、计算和显示测量结果，到用户设定的时间间隔时，仪器自动贮存测量数据（ 如果 USB 接口连接有 PC，仪器会自动打印出测量数据 ），然后开始下一次的测量。按“ 取消 ”键并“ 确认 ”后可以退出定时测量模式。

如果用户选择定时测量模式，需要再设置定时间隔，时间间隔1~99 分钟，默认间隔为 10 分钟。

平衡测量模式 用户首先应该设置好平衡条件 （详见“ 设置平衡条件 ”），开始测量后，仪器自动测量、计算并显示测量结果，一旦测量符合设定好的平衡条件，本次测量即结束。

在测量过程中，用户可以查阅测量参数、标定电极等。测量结束后，用户可以贮存、打印测量结果；按“ 取消 ”键退出测量状态，或者选择按“ 测量 ”键开始下一次测量。

设置平衡条件

平衡测量条件对应仪器的平衡测量模式，设置各测量参数的平衡条件，图 6 显示溶解氧的平衡条件即为 1.0%，当溶解氧测量值的变化量小于测量值的 1.0% 范围时即认为本次测量有效。

当用户选择平衡测量模式进行测量时，如果仪器在设定的平衡时间里面所有测量都符合平衡条件，则本次测量结束。平衡时间只对平衡测量模式有效，以秒 (s) 为单位，范围 1 ～ 200 秒

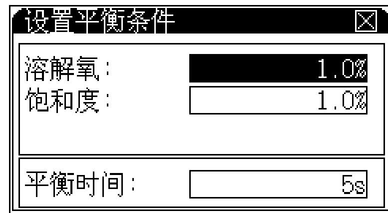


图 6

系统设置

系统设置包括 GLP 规范设置、电极标定提示间隔、系统时间等。按" 设置 "键，选择" 系统设置 "项，按" 确认 "键，仪器即进入系统设置模块，如图 7 所示。

按方向键移到至相应项后按" 设置 "键即可修改相应的参数值。修改完毕，按" 取消 "键退出设置状态，返回起始状态。

" 电极标定间隔 "是指仪器提示用户标定电极的时间间隔，仪器会自动计算前一次标定至今的时间，如果前一次标定时间已经超过用户设定的标定时间间隔，仪器即弹出提示窗口，提示用户注意重新标定电极，电极标定间隔以小时 (h) 为单位（设置零值将关闭提示）。

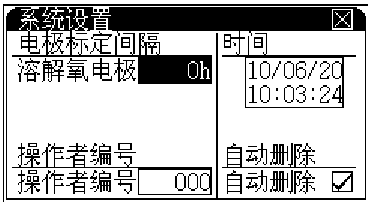


图 7

操作者编号是一个三位数的编号，编号范围为 000 ～ 200。

小心

自动删除贮存数据功能是指当贮存数据量达到仪器设定的贮存量时是否允许自动覆盖，重复贮存。比如，仪器允许贮存测量数据 200 套，当贮存第 201 套数据时，如果自动删除贮存数据功能打开，则仪器自动将第 201 套数据存入第一个数据的位置，即从头开始贮存，否则仪器会放弃当前的测量数据，望用户注意！如果用户没有选择自动功能，则仪器会提示用户是否选择从头开始贮存。

“ 设置系统时间 ”，移动至时间项，按 “ 设置 ” 键即可设置时间。显示如图 8，窗口显示当前时间，包括 “ 年 ”、“ 月 ”、“ 日 ”、“ 时 ”、“ 分 ”、 “ 秒 ”。

如果用户需要修改时间，按方向键移动光标至需要修改的时间项，按 “ 设置 ” 键，并输入相应时间值。

例如用户需要设置当前的月份时，可按如下方法操作：按方向键移动光标至 “ 月 ” 项，按 “ 设置 ” 键，仪器弹出输入窗口，用户按照当前月份输入，输入完毕按 “ 确认 ” 键退出输入窗口。同理，可修改其他时间项，等所有的时间项修改完毕，按 “ 确认 ” 键即完成最后的设置，按 “ 取消 ” 键退出系统时间设置模块。



图 8

语言设置

本仪器支持中英文版本，用户可以选择使用。在仪器起始状态下，按 “ 设置 ” 键选择 “ 语言设置 ” 后确认，用户即可选择中文或者英文版本。

设置大气压

仪器需要设置当前的大气压值（图 9），通常用户不需要设置，默认为 101.3kPa。

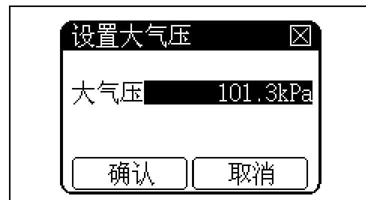


图 9

设置盐度值

仪器需要设置当前的盐度值 （图 10），通常用户不需要设置，默认为 0.0g/L。

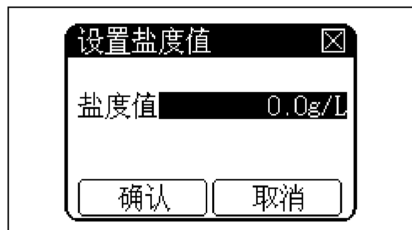


图 10

设置自动关机

本仪器支持自动关机功能，允许用户设置关机时间。自动关机时间为 10~480min，当仪器运行到设定的自动关机时间时，仪器将强制关机。设置零值，可以关闭自动关机功能。当仪器连接电化学数据采集软件时，此功能无效。

恢复默认设置

由于某些操作或者使用上的原因，可能会导致测量参数的改变，利用此功能可以恢复至默认值。执行此功能后的具体参数如下：

- 修改溶解氧标定数据至默认，具体的标定数据为
    - 零氧值：0 nA;
    - 满度值：1000 nA;
    - 标定温度：25.0 °C
    - 标定大气压值：101.3 kPa;
    - 标定盐度值：0.0 g/L。
- 设置测量模式为连续测量模式；
- 设置定时测量模式的定时间隔为 10 min ；
- 关闭标定间隔提示功能；
- 允许数据从头覆盖；
- 设置操作者编号为 000 ；
- 设置平衡测量模式下的溶解氧、饱和度等平衡条件为 1.0% ；

- 设置平衡测量模式下的平衡时间为 5 s ；
- 设置自动关机时间为 0，即关闭自动关机功能。

电极准备和标定

电极准备

1 把膜帽从电极上拧下来，把膜帽的内外都用蒸馏水冲洗干净并且甩干。
2 把电极的阴阳极组件用蒸馏水清洗，并擦干。
3 往膜帽里注入四分之三体积的溶解氧填充液 (5190-0547)。
4 把膜帽拧到电极上，直到拧紧为止。确保膜帽紧贴铂金层，膜帽和铂金层之间没有气泡。
5 极化电极。
电极使用前必须极化。极化一个新的电极，需要将电极连接仪器，仪器给电极供电，极化约 60 分钟。当电极连接在仪器上时，由于一直处于极化状态，因此不需要重复极化电极，除非电极需要维护或者从仪器上断开，超过 1 个小时。如果电极从仪器拔下不超过 1 个小时，在使用前只需极化 25 分钟。

电极的使用注意

搅拌　因为电极会消耗一些氧，所以电极膜附近溶液氧含量会变低，由于这个原因，水样需要搅拌。可以手动晃动电极以每秒20-80 cm 的速度水平晃动电极。或者使用搅拌器保持水样有一定流速。

膜　电极的透气膜片不能受到任何损伤，避免触碰膜片。膜片应当与电极阴极的头部完全接触无隔层。如果膜损坏，请更换新的膜帽。

内充液　溶解氧填充液在使用一段时间后需更换。溶解氧填充液使用时间与使用状况有关。根据使用情况需要在 2 星期至 2 个月里更换溶解氧填充液。

电极的标定

为了获得准确的测量结果，溶解氧电极测量前必须进行标定。仪器具有多种标定功能，有零氧标定、满度标定，如图 11 所示。

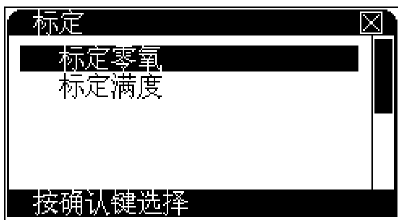


图 11

零氧标定

零氧标定过程如下：

溶解氧氧电极用蒸馏水清洗后放入 5% 的新鲜配制的亚硫酸钠溶液中。在测量状态下 (或者在仪器的起始状态)，按 " 标定 " 键选择标定零氧并确认后即可进入零氧标定状态，显示如图 12。

待读数稳定后，按 " 确认 " 键并再次确认后，仪器即自动记录零氧值，零氧标定结束。

在标定过程中，按 " 设置 " 键可以设置标定参数，如大气压、盐度值等。按 " 取消 " 键将结束标定。

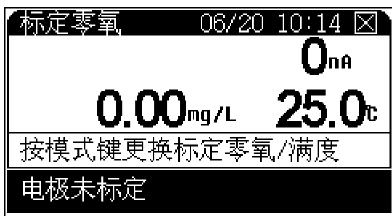


图 12

满度标定

满度标定过程如下：

把溶解氧电极从溶液中取出，用水冲洗干净，用滤纸小心吸干薄膜表面的水分，并放入盛有蒸馏水容器（如三角烧瓶、高脚烧杯中）靠近水面的空气上或者放入空气中，但电极表面不能沾上水滴。

在测量状态下（或者在仪器的起始状态），按“标定”键选择标定满度并确认后即可进入满度标定状态，显示如图 13。待读数稳定后，按“确认”键并确认后，仪器自动记录满度值，满度标定结束。

在标定过程中，按“设置”键可以设置标定参数，如大气压、盐度值等。按“取消”键将结束标定。



图 13

小心

在任意一种标定结束后，仪器将自动提示用户是否进行另一种标定，比如零氧标定结束后仪器将提示用户是否进行满度标定，反之亦然。另外，在标定过程中，用户可以直接按“模式”键在标定零氧、标定满度之间切换。

溶解氧的测量方法

若您是第一次使用或长时间未使用，请先进行溶解氧电极的标定，具体参见溶解氧标定章节。

在“设置测量模式”里面选择好测量参数，将溶解氧电极插入待测溶液中，按“测量”键，仪器显示如图 14。



图 14

其中显示屏上方显示有当前的测量模式、系统时间；溶解氧测量结果以及对应的溶解氧电流值和当前温度值；下方为上次的标定结果。

测量和显示方法会随不同的测量模式而略有不同。在测量过程中，用户可以重新标定电极、设置测量参数等；测量结束后，用户可以贮存、打印测量数据。按 " 取消 " 键结束测量。

饱和度的测量方法

类似于溶解氧的测量方法，首先选择合适的测量模式、饱和度测量参数，具体设置参见 " 设置测量模式 " 章节。

开始测量后，仪器显示饱和度的值，其操作方法类似于溶解氧测量方法，具体参见溶解氧测量方法。

温度的测量方法

在任意测量状态下，仪器将直接显示当前溶液的温度值。具体操作参见溶解氧的测量章节。

数据贮存功能

本仪器支持贮存 200 套测量数据，超过 200 套时将从头开始贮存。在不同的测量模式下，数据贮存方式有所不同，在连续测量模式和平衡测量模式，用户需等待测量结果稳定后按“贮存”键来手动贮存测量数据；在定时测量模式时，仪器按照设定的定时间隔，自动定时贮存测量结果，当然用户也可以手动贮存结果。具体的测量操作方法参见前面相关章节。

数据删除功能

仪器支持贮存测量数据，也支持删除测量数据功能。对于某些因操作不当、或其他原因造成的不确定测量结果，用户可以逐个删除或者全部删除。仪器只有在查阅贮存数据状态下才能完成操作。具体操作方法如下：通常在仪器的起始状态下或者测量状态下，按“查阅”键选择查阅相应贮存数据，进入查阅贮存数据后，按“删除”键，选择相应操作即可。

数据输出功能

如果用户需要输出当前的测量数据、上次标定数据或者已贮存的数据，有两种方法可以实现。一种是使用数据采集软件连接仪器。

另一种是使用本公司提供的数据打印软件。用 USB 连接线连接仪器与 PC 机，然后在 PC 机上运行本软件，当用户在测量、查阅标定数据、查阅存贮数据时按“输出”键，本软件将自动接收仪器发送的相应数据，用户选择打印即可，详细参见软件操作指南。

数据查阅功能

3200D 型溶解氧测定仪允许用户查阅当前的测量参数，包括上次的标定数据和当前使用参数等；允许用户直接修改测量参数；允许查阅贮存数据。在仪器的起始状态，按 " 查阅 " 键，并选择相应选项即可查阅、修改测量参数和查阅贮存数据 （图 15）。

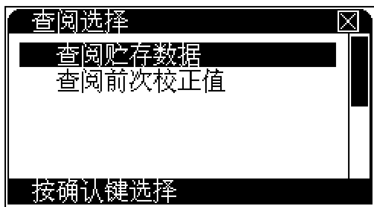


图 15

查阅贮存的数据

仪器按照测量参数贮存数据，所有贮存数据支持 GLP 规范。仪器允许贮存 200 套测量数据。

在仪器的起始状态，按 " 查阅 " 键，选择 " 查阅溶解氧贮存数据 " 显示如图 16 数；每页最多可显示 10 个贮存数据，显示情况随不同查阅模式而不同，主要包括贮存时间、操作者编号等。用户按方向键查看每个贮存数据。此时，如果用户需要删除贮存数据 , 按 " 删除 " 键选择相应操作。如果需要打印输出贮存数据、，按 " 输出 " 键 （首先通过 USB 连接线连接 PC，具体设置参加数据输出功能）选择相应操作，其输出格式大概如下：

```
========================
MODEL
                      3200D
       DISSOLVED OXYGEN
            DETERMINATOR
                   VER 1.00
PRINT TIME
                09:03:28
```

```
              2010/06/20
OPERATOR NO
                     000
************************
STORED NUM:          003
************************
                  NO:001
OPERATOR NO:         000
STORED TIME:    10:43:00
              2010/06/20
PRESSURE:       101.3kPa
SALINITY:         0.0g/L
ZERO OXYGEN:         0nA
FULL OXYGEN:      1000nA

CURRENT:             0nA
DO:            0.00mg/L
SATURATION:         0.0%
TEMP:              25.0c
************************
                  NO:002
OPERATOR NO:         000
STORED TIME:    10:43:00
.........
========================
```

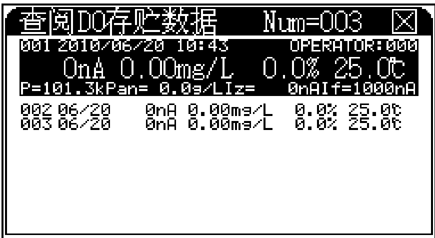


图 16

查阅测量参数

在仪器的起始状态下，按“查阅”键，选择“查阅前次校正值”后，按“确认”键即可查阅前一次的校正信息，显示如图 17，其中显示屏上方为上次的标定结果；下面为标定参数。

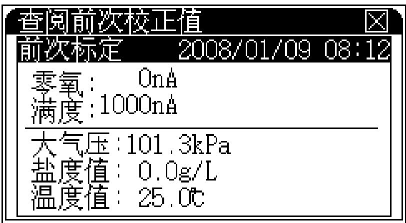


图 17

如果用户需要打印当前的参数数据，可通过 USB 连接线连接 PC，按“输出”键输出标定数据，具体设置请参阅打印输出功能。打印输出格式大概如下：

```
========================

MODEL

3200D

DISSOLVED OXYGEN

DETERMINATOR

VER 1.00

PRINT TIME
```

```
09:14:03
2010/06/20
OPERATOR NO
000
************************
DO CALIB DATA
CALIB TIME:      08:12:00
2008/01/09
OPERATOR NO:          000

PRESSURE:        101.3kPa
SALINITY:          0.0g/L
ZERO OXYGEN:          0nA
FULL OXYGEN:       1000nA
TEMP:               25.0c
========================
```

关闭 3200D 型溶解氧测定仪

用户使用完毕，如果需要存贮数据请确保已按“贮存”键，此时按仪器的“On/Off”关闭仪器。测试完样品后，所用电极应浸放在蒸馏水中。如果仪器长期不用，请注意：

1 断开电源适配器的电源，以免损坏电源适配器并间接损坏仪器，给您带来不必要的损失！

2 仪器的插座必须保持清洁、干燥，切忌与酸、碱、盐溶液接触。

3 仪器的输入端(溶解氧/温度的接口)必须保持干燥清洁。在环境湿度较高的场所测量后，用干净纱布擦干电极插头。

4 溶解氧电极不用时，切忌将电极浸入亚硫酸钠溶液中，因为上述溶液一旦渗透到电极腔体内，会使电极性能恶化。

5 从电极上拧下膜帽，除去内溶液。
6 用蒸馏水冲洗阴阳极组件并且擦干。
7 请在干燥处保存电极。

更正问题

- 接通电源后 , 若显示屏不亮 , 应检查电源适配器是否有电压输出。
- 短期内溶解氧电极不用时，应将电极储藏于煮沸冷却后的蒸馏水中，切忌将电极浸入亚硫酸钠溶液中，因为上述溶液一旦渗透到电极腔体内，会使电极性能恶化。
- 新装电解液和薄膜后，需要极化 60 分钟后才能使用。
- 仪器必须有良好的接地，防止腐蚀性气体侵入。
- 若上述各种情况排除后 , 仪器仍不能正常工作 , 则与有关部门联系。

软件通讯操作

本节描述 3200D 型溶解氧测定仪通讯软件的安装和操作。

安装电化学数据采集软件

3200D 型溶解氧测定仪通过电化学数据采集软件与计算机建立通讯。

本软件是为了方便用户使用而开发的一套数据采集软件 (本软件 G4390A 需要另外购买)。如果用户需要，请选择安装。

将安装光盘插入您 PC 上的 DVD 驱动器，然后按照数据采集软件说明安装，安装完毕后，可以从桌面图标或 " 开始 " 菜单打开软件。

软件通讯界面操作

1 连接仪器电源，按 "On/Off" 键打开仪器。
2 用 USB 连接线连接仪器与 PC 机。
3 在 PC 机运行电化学数据采集软件，软件将自动识别连接的仪器型号、类型，并自动配置相应的功能；详细参见电化学数据采集软件使用说明书。

安装数据打印软件

可选择安装免费的数据打印软件。

数据打印软件界面操作

1 连接仪器电源，按 "On/Off" 键打开仪器。
2 连接仪器与 PC 机。
3 在 PC 机运行数据打印软件。当仪器处于测量状态、查阅上次标定数据或者查阅存贮数据时，用户按 " 输出 " 键，软件将接收仪器发送的数据，用户选择打印即可，详细参见数据打印软件使用说明书。



3
3200D 型溶解氧测定仪故障排除

此文档提供仪器基本故障解决方法，如果在使用过程中，仪器出现故障，可根据本文件排除基本故障。

仪器基本故障以及解决办法

编号	故障项目	故障原因	解决办法
1	仪器开机不显示	**1** 电源适配器安装有问题 **2** 使用的电源与要求的不一致 **3** 电源适配器损坏 **4** 电源插座接触不良 **5** 可能液晶损坏 （开机一段时间后，按“开关”键能听到蜂鸣声，但液晶始终无显示）	**1** 按说明书重新安装 **2** 请使用仪器要求的电源 **3** 更换电源适配器 **4** 保证接触良好 **5** 联系代理商
2	按键无蜂鸣声	**1** 按下了无效的按键。 **2** 蜂鸣器损坏	**1** 只有当前功能下有效的按键被按下时才有蜂鸣声； **2** 联系代理商
3	按键无响应	**1** 按下了无效的按键 **2** 按键损坏	**1** 选择有效的按键操作 **2** 联系代理商
4	测量时跳字严重，甚至无法正常测量	**1** 电极已损坏，或过保质期 **2** 周围有强干扰的信号存在	**1** 更换电极 **2** 隔开测量溶液与干扰源的联系，比如抬高测量溶液的烧杯；用仪器随机提供的接地线连接，一头连接仪器，一头连接干扰源的外壳。

仪器自诊断操作指导

仪器在使用过程中，有很多的因素会影响测量结果，包括测量使用的电极、标定电极的标准溶液、样品溶液、测量时的温度、搅拌速度、离子强度调节剂、操作或者使用不当、参数设置等等。当出现测量结果与预想的结果值相差甚远时，为了更好地快速判断是仪器本身还是仪器以外的因素导致测量误差，可以参照本操作指导进行简单的自我诊断。

仪器的电流值诊断

仪器连接随机提供的 ATC 温度诊断工具（5185-8390），开机，进入测量状态，此时仪器显示的电流值为680～720nA左右；断开溶解氧插头时，仪器显示的电流值为 0-5nA 左右，表示仪器测量正常。如果偏差很大，则表示仪器硬件有问题，请联系相关部门。

溶解氧电极诊断

通常，仪器连接溶解氧电极后，等待一段时间，溶解氧电极在空气中的电流值将稳定在 300 ～ 1000nA 左右 （具体参见溶解氧电极说明书），否则说明电极有问题。

仪器的温度诊断

仪器连接随机提供的 ATC 温度诊断工具（5185-8390），开机，进入测量状态，此时仪器显示的温度值在 49.0 ～ 51.0 ℃左右，则表示仪器的温度测量正常。如果偏差很大，则表示仪器硬件有问题，请联系相关部门。

按照上述方法可简单判断是仪器本身硬件、电极标定数据，还是电极以外的测量因素导致测量误差。对应仪器以外的原因，用户可以使用类比的办法，将电极放置在不同的标准溶液中，查看测量的电流值，类比判断是电极本身，还是溶液问题，抑或是其他原因。在溶解氧测量中，搅拌速度可能是影响测量的一个很重要的因素。

仪器自诊断相应代码与说明

本仪器支持自诊断功能，能描述常规的由于仪器本身、电极本身、溶液本身、或者操作本身而导致的一些错误。针对不同错误的严重程度，仪器予以区别对待和处理。通常仪器分为二大类错误，一类是严重的系统错误，这类错误将直接影响仪器的进一步使用，无法完成必要的工作，而不得不做更换、维修等处理；另一类错误较为轻微，属于提示、警告之类。这些错误由多种原因导致，同样可以有多种方法解决、应对，用户必须重视这些警告，才能保证数据的完整性、可靠性。当然，用户可以暂时忽略这些警告和提示，而不影响仪器的使用。

严重错误

仪器发现严重的错误时，将直接停机，并提示错误，此时用户除了关机外无法再进行任何操作。仪器的提示示意图：

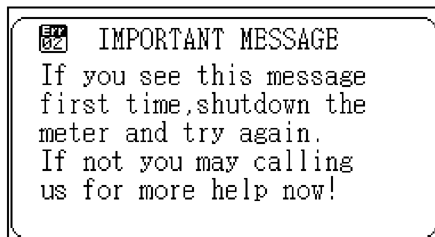


图 **18**

警告错误

在使用过程中，由于电极本身、溶液本身或者操作本身等原因导致错误警告出现，用户应重视这些错误提示，仔细阅读操作提示，并严格按照仪器说明书、电极说明书操作、保养和使用，将错误减少到最小。

图示即为测量时，由于温度超出测量范围而出现的错误警告。

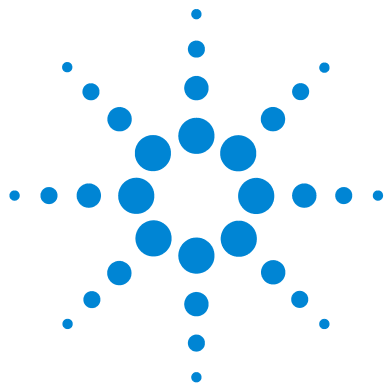


图 19

Err 24 为错误警告标志，数字表示错误代码，具体见下表的描述。注意：下表内容为多参数所有错误号的描述，对应不同的仪器，用户查看相关内容即可。

表 1 错误警告代码表

NO	代码	描述	解决办法	备注
1	00	电导测量模块错误	联系代理商	严重错误
2	01	溶解氧测量模块错误	联系代理商	严重错误
3	02	温度测量模块错误	联系代理商	严重错误
4	03	数据存贮错误	联系代理商	严重错误
5				
6				
7	20	电位超出量程	更换电极	–1999.9 ～ 1999.9 mV
8	21	pH/pX 超出量程	更换电极	–3.000 ～ 21.000 pH
9	22	电导率超出量程	更换电极、更换溶液	0 ～ 2000 mS/cm
10	23	电阻率超出量程	更换电极、更换溶液	0 ～ 100 Mohm.cm
11	24	温度超出量程	更换电极、降低溶液温度	–6.0 ～ 120.0 °C
12	25	溶解氧电流超量程	更换电极	0 ～ 4000 nA
13	26	pH 电极斜率超范围	更换电极、重新标定	80 ～ 120%
14	27	无法识别 pH 标液	更换电极、设置合适的标液组、更换标液	
15	28	pH 标液温度超范围	降低标液温度	
16	29	重复标定同一种标液	更换标液	操作错误导致
17	30	选择的 pH 标液数已最大	先清除某个标液	最大标液数 5 个
18	31	pH 标液相互有冲突	先清除相邻标液	
19	32	到达最大存贮数据	可选择覆盖后，从头存贮	不删除全部数据
20	33	时钟电池电压过低	手动设置时间	
21	34	最大用户自定义离子数	删除不必要的离子	
22	35	最大存贮离子模式数	删除某个离子模式下的全部存贮数据	



4
电极的保养、维护和贮存

本节描述相关电极的保养、维护和贮存信息。

溶解氧电极的保养和维护

1 从电极上拧下膜帽，除去内溶液。
2 用细砂皮打磨阴极阳极，进行抛光处理。
3 用蒸馏水冲洗阴阳极组件并且擦干。
4 在新膜帽里充满四分之三的溶解氧填充液。
5 把膜帽缓慢拧到电极上，并确定已经拧紧。
6 极化电极。电极使用前必须极化。极化新电极，需要把电极连接仪器，仪器给电极供电，等待约 60 分钟。当电极连接仪器时，由于一直处于极化状态，因此不需要重复极化电极，除非电极需要维护或者从仪器上断开超过 1 个小时的时。如果电极从仪器上断开不超过 1 个小时，使用前只需极化 25 分钟。

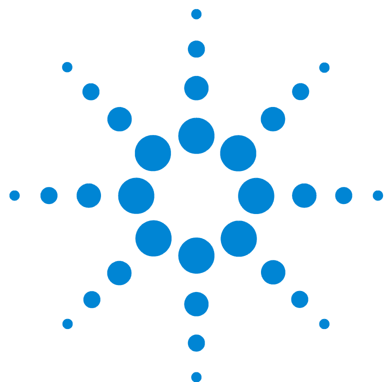
溶解氧电极的储存

短期存放

过夜或者测量之间，应该将电极连接仪器，并且插在校准瓶里或者放在蒸馏水烧杯中。

长期存放

将电极从仪器上断开连接。拧下膜帽，甩掉溶解氧填充液，用蒸馏水冲洗阴阳极组件和膜帽，并且擦干阴阳极组件，然后再把膜帽拧上电极。请不要在膜帽中添加溶解氧填充液。请在干燥处保存电极。



5
3200D 溶解氧测定仪耗材信息

此文档提供 3200D 型溶解氧测定仪的耗材信息，内容包括订货号，名称和描述。

订货号	型号名称	描述
G4388A	3200SA 型搅拌器	将电极支架和磁力搅拌器组合，能在较大的范围内对溶液进行稳定和精密的搅拌
G4389A	3200EA 型电极支架	各种不同电极的固定装置
G4390A	软件包	在计算机上安装软件包可实现仪器与计算机通讯 （含软件）
5185-8389	电源适配器	100 ～ 240 VAC， 1 A， 50/60 Hz
G4388-27000	搅拌棒	搅拌器配套用
5190-3997	D6111 型溶解氧电极	塑壳，带温度传感器极谱式 （含溶解氧填充液、溶解氧膜套 *3），测量范围 0-20 mg/L， 0 ～ 45 °C
5185-8390	ATC 温度诊断工具	温度诊断
5190-0547	溶解氧填充液	瓶装， 3 × 30 mL
5190-0548	溶解氧膜套	3 只 / 套

备注：Agilent 建立了一个客户门户网站，可为您所拥有的产品提供详细的相关信息。该门户网站的登录地为 http://www.agilent.com/chem。

如需购买，请与安捷伦经销商联系或者登陆安捷伦官方网站。

www.agilent.com

Printed in China 03/12
First edition, March 2012



5973-1779



Agilent Technologies